Evaluation Methodology

Peer Review

For

Basin-Specific Feasibility Studies

Everglades Protection Area Tributary Basins

(Draft,

For Review and Comment)

Submitted to

South Florida Water Management District

October 16, 2001

Contract No. C-E023

Project No. 29042

In Association with

NOVA CONSULTING, INC.

October 16, 2001

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South Florida Water Management District
Contract C-E023, Basin-Specific Feasibility Studies
Peer Review of Evaluation Methodology
B&McD Project No. 29042

Dear Ms. Piccone:

Burns & McDonnell, in association with Nova Consulting, Inc, is pleased to submit this Draft of the *Evaluation Methodology Peer Review* for your review and comment.

This document comprises the Draft document required under Subtask 2.2 of the Statement of Work (Appendix "C" to Contract C-E023).

We look forward to receipt of your review comments. Please feel free to contact me at 816-822-3099 or electronically at gmiller@burnsmcd.com should you have any questions or desire additional information.

Sincerely,

Galen E. Miller, P.E.
Associate Vice President

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EXECUTIVE SUMMARY

The long-term Everglades water quality objective is to implement the optimal combination of source controls, STAs, Advanced Treatment Technologies (ATTs), and/or regulatory programs to ensure that all waters discharged to the Everglades Protection Area (EPA) achieve water quality goals by December 31, 2006. Permit applications and integrated water quality plans are to be submitted to the Florida Department of Environmental Protection (FDEP) by December 31, 2003. To meet these objectives and time frames, the District is conducting basin-specific feasibility studies that will integrate information from research, regulation, and planning studies to provide information necessary to allow policy makers to determine the optimal combination of source controls and basin-scale treatment to meet the final water quality objectives.

The results of these studies are not intended to define the final arrangement, location and character of the final strategy for each basin. Rather, the purpose of the evaluation is to develop the information necessary for informed decision-making by the District's Board of Governors and the Florida Legislature relative to funding, final implementation schedule, rulemaking, and those other policy-level determinations necessary to permit the State of Florida and the South Florida Water Management District to proceed to fulfillment of their obligations under the federal Everglades Settlement Agreement (Case No. 88-1886-CIV-HOEVELER) and Florida's 1994 Everglades Forever Act (F.S. 373.4592).

In order to assure that the evaluation of alternative water quality improvement strategies in each of the fourteen basins is developed on a consistent and comprehensive basis, the District has prepared a Review Draft *Evaluation Methodology for the Water Quality Improvement Strategies for the Everglades*, dated August 31, 2001. The District's *Evaluation Methodology* is being subjected to peer review by both Burns & McDonnell (under Contract C-E023) and Brown & Caldwell (under Contract C-E024). In addition, the District has solicited review comments from external agencies and stakeholders.

This document present the results of a Peer Review of that *Evaluation Methodology* prepared by Burns & McDonnell Engineering Company, Inc., in association with Nova Consulting, Inc. The conduct of the Burns & McDonnell peer review of the *Evaluation Methodology* and preparation

of this document was authorized by the District's Board of Governors through its approval of Contract C-E023 at its September, 2001 meeting.

Baseline Data

With respect to the ECP Basins, the STA inflows presented in the May 2001 *Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-Term Water Quality Goals for the Everglades*, prepared by District staff., represent a continued refinement in the estimation of both the average annual and temporally distributed inflow volumes and TP loads to the STAs, as compared to estimates employed in the design of the STAs. In general, the *Baseline Data* include somewhat higher average annual inflow volumes (overall, an increase of 11%) and lower average annual TP loads in the inflows (overall, a decrease of 20%) than employed in the original design of the STAs. The more recent and refined estimates presented in the *Baseline Data* are considered more representative of current conditions, and are preferred for use in the conduct of the Basin-Specific Feasibility Studies (BSFS). It should, however, be noted that those inflows are for current conditions, assuming full implementation of the Everglades Construction Project, but prior to implementation of any projects included in the Comprehensive Everglades Restoration Plan (CERP). These inflow data will require adjustment to reflect changes resulting from implementation of scheduled CERP projects.

A variety of algorithms were employed in development of the STA outflows presented in the *Baseline Data*, none of which are entirely consistent with the analytical tools and methods otherwise proposed for use in conduct of the Basin-Specific Feasibility Studies. In all basins for which there is an existing (or soon to be completed) STA, it is recommended that the calibrated DMSTA model proposed for use in evaluating the performance of alternatives be operated (using the most recent STA inflow estimates) to generate a new set of outflow data. That new set of outflow data would then form the baseline condition against which alternative combinations of water quality improvement strategies are evaluated.

CERP Integration

It is our opinion that the statutory mandates for integration of CERP with the water quality improvement strategies in basins tributary to the EPA can more effectively be addressed through:

- Structuring preliminary combinations of alternative water quality improvement strategies to allow direct identification of the benefits (and costs) of incorporating CERP projects as integral elements of those strategies.
- Refining the remaining evaluation criteria such that they permit direct integration of those benefits and costs in the evaluation process.

We recommend that the baseline (e.g., "no action") condition for the Basin-Specific Feasibility Studies consider completion of the CERP projects as a baseline condition. In our opinion, this will require three separate analyses in order to establish the baseline projections of the total phosphorus load discharged to the Everglades over the planning period in the event of no incremental action for additional water quality improvement strategies in the basins included in the BSFS.

The first set of analyses will be to estimate the average annual phosphorus load discharged pre-CERP, using the *Baseline Data* previously prepared by the District (for basins with an existing STA, this will extend to running the 30-year simulation with the STA inflow data of the *Baseline Data*, using the DMSTA to establish "no-action" discharges).

The second set of analyses would be prepared for modified inflow data representative of conditions that would exist following completion of currently authorized CERP and critical restoration projects. The analyses would be conducted for the full 30-year simulation, and a second set of "no-action" average annual discharges computed. This will require development of the revised inflows through use of the District's SFWMM software for that case (a close approximation could consist of a year 2010 run).

The third set of analyses would be prepared for modified inflow data representative of conditions that would exist following full CERP implementation. Once again, the analyses would be conducted for the full 30-year simulation, and a third set of "no-action" average annual discharges computed.

The first set of average annual discharges would be considered as applicable to the period between the start of the analysis period (January 2007, see subsequent discussion in this Section

3) and the completion of currently authorized CERP projects which could impact inflow volumes and loads in any given basin (January 2010 could be used as a surrogate for that date). The third set of average annual discharges would be considered as applicable to the period following full implementation of those CERP projects which could substantially impact inflow volumes and loads in a given basin (not necessarily full completion of CERP). In the ECP basins, that might presently be selected as 2023 (completion of storage projects upstream of Lake Okeechobee).

For the period between completion of currently authorized projects and full CERP implementation, average annual discharges for the baseline condition would be computed on uniform gradient between the estimates resulting from the second and third set of analyses. The date ranges selected for the three sets of analyses would be established following the next update of the CERP Master Program Management Plan (scheduled for November 2001).

All alternative plans of improvement would then be evaluated against that composite baseline condition.

Technical Evaluation Criteria

Table 1 summarizes our recommendations for refinement of the technical evaluation criteria proposed in the *Evaluation Methodology*.

Table 1. Recommended Refinements to Technical Evaluation Criteria

Evaluation Criteria	Recommendation/Remarks
Technical Performance	
Level of phosphorus load reduction	**No change** recommended
Mean outflow phosphorus concentration	**Clarify**: intent to apply mean outflow concentration in ppb; recommend application to performance of completed alternative for time-phased implementation.
Implementation Schedule	**Delete**: not truly a technical performance criteria, impacts considered in other criteria. Evaluate all alternatives on a 50-year period 2007-2057.
Operational flexibility	**Clarify**; intent is to score relative to impact on operational flexibility of regional system. **Modify** scoring range, extend from –6 to +6; -6 to –4; reduced flexibility -1 to +1; little or no influence +4 to +6; adds flexibility
Resiliency to extreme conditions	**Modify** scoring range, extend from –4 to +4; assess resiliency to each of 4 event types separately.
Assessment of full-scale construction and operation	**Modify** scoring range, extend from –4 to +4; group ranges –4 to –2; -1 to +1; and +2 to +4
Management of side streams	**Modify** scoring range, extend from –4 to +4; -4 to –2; extensive effort, adverse impact 0; no management +2 to +4; net benefit
Environmental	
Level of improvement in non-phosphorus parameters	**Modify** scoring: Range from –19 to +19; +1 for each parameter improved, -1 for each parameter worsened, 0 for no significant change.
Clean Water Act guidelines	**Delete**: requires judgments outside the technical scope of the evaluation, more properly considered in subsequent phases.
Economic	
Private Cost	**Clarify**: 50-year period of analysis, all pricing at current levels (no escalation for economic comparisons), 6-3/8% discount rate, Jan. 1 2007 evaluation date.
Public Cost	
Cost-effectiveness	
Impacts on South Florida jobs	**Delete**: requires judgments and specific data outside the technical scope of the evaluation, more properly considered in subsequent phases.
CERP Integration	
Cost savings due to integration with CERP	**Delete all**: Duplicate other criteria, and more properly considered in the structure of alternatives to be evaluated.
Additional time to implement	
Water quantity, timing and distribution	

1. INTRODUCTION

Florida's 1994 Everglades Forever Act (Act) establishes both interim and long-term water quality goals to achieve restoration and protection of the Everglades Protection Area (EPA). The District, in partnership with other agencies and private landowners, is aggressively and successfully achieving these interim milestones. The District has constructed four Stormwater Treatment Areas (STAs) totaling almost 20,000 acres, and has just begun construction of the largest one, STA-3/4, with more than 17,000 acres. In addition, the Corps of Engineers is constructing the 5,500-acre STA-1 East. The STAs, coupled with on-farm Best Management Practices (BMPs) are designed to reduce the total phosphorus (TP) concentration in runoff from approximately 150 ppb to an interim target of 50 ppb. EAA landowners have implemented BMPs that have reduced phosphorus loads by more than 50% over the last six years. Concurrent with implementation of the Everglades Construction Project (ECP), the District is implementing the Everglades Stormwater Program (ESP) to address the water quality issues associated with discharges from the remaining non-ECP Everglades tributary basins. Also concurrent with these activities, the District and other groups are conducting water quality research and ecosystem-wide planning, and implementing regulatory programs to ensure a sound scientific foundation for decision-making.

The long-term Everglades water quality objective is to implement the optimal combination of source controls, STAs, Advanced Treatment Technologies (ATTs), and/or regulatory programs to ensure that all waters discharged to the Everglades Protection Area (EPA) achieve water quality goals by December 31, 2006. Permit applications and integrated water quality plans are to be submitted to the Florida Department of Environmental Protection (FDEP) by December 31, 2003. To meet these objectives and time frames, the District is conducting basin-specific feasibility studies that will integrate information from research, regulation, and planning studies to provide information necessary to allow policy makers to determine the optimal combination of source controls and basin-scale treatment to meet the final water quality objectives.

The goal of the basin-specific feasibility studies is to integrate research, planning and other available information into viable water quality improvement strategies to ensure that all waters discharged into the EPA achieve water quality goals. Of the sixteen basins that discharge into the

EPA, the basin-specific feasibility studies will identify and evaluate alternative combinations of source control and basin-scale treatment for fourteen hydrologic basins – eight basins covered by the Everglades Construction Project (ECP) and six basins covered by the Everglades Stormwater Program (ESP). The remaining two ESP basins (C-111 Basin and Boynton Farms Basin) will be addressed through other District and Federal programs.

Basin-specific feasibility studies for the eight basins covered by the ECP will be prepared by Burns & McDonnell under the District's Contract No. C-E023. Basin-specific feasibility studies for the six basins covered by the ESP will be prepared by Brown & Caldwell under the District's Contract No. C-E024.

The results of these studies are not intended to define the final arrangement, location and character of the final strategy for each basin. Rather, the purpose of the evaluation is to develop the information necessary for informed decision-making by the District's Board of Governors and the Florida Legislature relative to funding, final implementation schedule, rulemaking, and those other policy-level determinations necessary to permit the State of Florida and the South Florida Water Management District to proceed to fulfillment of their obligations under the federal Everglades Settlement Agreement (Case No. 88-1886-CIV-HOEVELER) and Florida's 1994 Everglades Forever Act (F.S. 373.4592).

1.1. Review Objectives

In order to assure that the evaluation of alternative water quality improvement strategies in each of the fourteen basins is developed on a consistent and comprehensive basis, the District has prepared a Review Draft *Evaluation Methodology for the Water Quality Improvement Strategies for the Everglades*, dated August 31, 2001. That document (hereinafter referred to as the *Evaluation Methodology*) was distributed for external review by other agencies and stakeholders in the various basins.

This document present the results of a Peer Review of that *Evaluation Methodology* prepared by Burns & McDonnell Engineering Company, Inc., in association with Nova Consulting, Inc. The purpose of the review is to propose recommendations for refinement to the District's *Evaluation Methodology*, including the evaluation criteria and analytical tools.

1.1.1. Coordination with Parallel Reviews by Others

The District's *Evaluation Methodology* is being subjected to peer review by both Burns & McDonnell (under Contract C-E023) and Brown & Caldwell (under Contract C-E024). In addition, the District has solicited review comments from external agencies and stakeholders; the primary forum for discussion of the external review comments has been the meeting(s) of the Stormwater Treatment Area Design Review Group (STADRG). Following receipt of review comments and suggestions from all sources, the District, Burns & McDonnell and Brown & Caldwell will jointly finalize the evaluation methodology to be employed in the conduct of the various basin-specific feasibility studies.

1.1.2. Refinements Previously Recommended by STADRG

The *Evaluation Methodology* was discussed at a September 17, 2001 meeting of the STADRG. Minutes of that meeting are included as Appendix A to this document. At that meeting, it was agreed that the scoring range of 1-9 (sic) for those criteria that have a potentially negative response would be modified to range from –5 to +5. Although that change would not impact the actual operation of the Criterium Decision Plus software proposed for use in the post-evaluation decision making process, the final decision-making by the District's Board of Governors and the Florida Legislature may or may not make extensive use of that particular tool. The suggested change does in our opinion more clearly express the relative desirability of an alternative with respect to such a criterion. We concur with that change.

1.2. Authorization

The conduct of the Burns & McDonnell peer review of the *Evaluation Methodology* and preparation of this document was authorized by the District's Board of Governors through its approval of Contract C-E023 at its September, 2001 meeting. This document comprises the

deliverable required under Task 2 as it is defined in Exhibit "C" *Scope of Services* attached to that contract.

2. ANALYTICAL TOOLS

Five analytical tools are proposed for use in the *Evaluation Methodology*, four by direct reference in that document, and one by reference in Appendix "C" to Contract C-E023. Those tools include:

- Baseline (e.g., "no project") data developed by the District for each of the fourteen basins to be addressed in the Basin-Specific Feasibility Studies.
- The Dynamic Model for Stormwater Treatment Areas (DMSTA)
- The Supplemental Technology Standard for Comparison (STSOC) prepared by others for the supplemental treatment technologies.
- A District-furnished spreadsheet for sizing of Chemical Treatment and Solids Separation (CTSS) facilities.
- Criterium Decision Plus software produced by Infoharvest, Inc. Although this software will not be employed in the conduct of the Basin-Specific Feasibility Studies, it is proposed for use in the post-evaluation decision-making process. It is considered necessary to understand how the data developed during the evaluation may subsequently be used in order to assess the suitability of the proposed scoring process for the various evaluation criteria.

2.1. Baseline Data

The District has previously published baseline hydrologic and water quality (phosphorus loads and concentrations) data intended for use in the conduct of the basin-specific feasibility studies. The development of that data is documented in a May 2001 *Baseline Data for the Basin-Specific Feasibility Studies to Achieve the Long-Term Water Quality Goals for the Everglades*, prepared by District staff. We have reviewed the information presented in that document with specific emphasis on those basins included in the scope of services for Contract C-E023; we have not reviewed that data for the six ESP basins to be addressed by Brown & Caldwell under Contract C-E024.

The basins included in the scope of work under Contract C-E023 include each of the basins for which a stormwater treatment area (STA) has been or is being constructed under the Everglades Construction Project (ECP). The *Baseline Data* includes estimated inflows to and outflows from each of the STAs.

2.1.1. STA Inflows

The STA inflows presented in the *Baseline Data* represent a continued refinement in the estimation of both the average annual and temporally distributed inflow volumes and TP loads to the STAs, as compared to estimates employed in the design of the STAs. A summary comparison of the inflow estimates presented in the Baseline Data to those design estimates is presented in Table 2.

Table 2. Comparison of Ave. Annual STA Inflows to Design Values

STA	Design Values			BSFS Baseline Data		
	Volume (ac-ft/yr)	TP Load (kg/yr)	TP Conc. (ppb)	Volume (ac-ft/yr)	TP Load (tonnes/yr)	TP Conc. (ppb)
STA-1E	124,900	29,500	191	133,331	28,950	176
STA-1W	142,853	37,701	214	160,335	27,399	139
STA-2	174,641	33,764	157	233,473	28,831	100
STA-3/4	645,222	94,280	118	660,889	72,019	88
STA-5	78,340	25,420	262	85,637	17,634	167
STA-6	53,633	14,190	214	80,532	12,050	121
Total	**1,219,589**	**234,855**	**156**	**1,354,197**	**186,883**	**111**

(1) Design values for STA-1E, STA-1W, and STA-2 were taken from the *Everglades Protection Project Conceptual Design*; Burns & McDonnell; February 15, 1994.

(2) Design values for STA-3/4 were taken from the *Plan Formulation, Stormwater Treatment Area 3/4 and East WCA-3A Hydropattern Restoration*; Burns & McDonnell; June 30, 2000. TP loads in basin runoff computed assuming a 25% reduction from historic due to implementation of BMPs.

(3) Design values for STA-5 were taken from the *Final Design Report, Stormwater Treatment Area No. 5*; Burns & McDonnell; September 10, 1997. Values are after partial diversion of C-139 Basin discharges to STA-6 following completion of Section 2.

(4) Design values for STA-6 were taken from the Prefinal Draft of *Detailed Design Report, Stormwater Treatment Area No. 6 (STA-6)*; Burns & McDonnell; March 1997.

In general, the *Baseline Data* include somewhat higher average annual inflow volumes (overall, an increase of 11%) and lower average annual TP loads in the inflows (overall, a decrease of 20%) than employed in the original design of the STAs. The more recent and refined estimates presented in the *Baseline Data* are considered more representative of current conditions, and are preferred for use in the conduct of the Basin-Specific Feasibility Studies (BSFS). It should, however, be noted that those inflows are for current conditions, assuming full implementation of the Everglades Construction Project, but prior to implementation of any projects included in the Comprehensive Everglades Restoration Plan (CERP). These inflow data will require adjustment to reflect changes resulting from implementation of scheduled CERP projects.

2.1.2. STA Outflows

A variety of algorithms were employed in development of the STA outflows presented in the *Baseline Data*, none of which are entirely consistent with the analytical tools and methods otherwise proposed for use in conduct of the Basin-Specific Feasibility Studies. In all basins for which there is an existing (or soon to be completed) STA, it is recommended that the calibrated DMSTA model proposed for use in evaluating the performance of alternatives be operated (using the most recent STA inflow estimates) to generate a new set of outflow data. That new set of outflow data would then form the baseline condition against which alternative combinations of water quality improvement strategies are evaluated.

2.2. DMSTA

In the *Evaluation Methodology*, it is proposed to assess the performance of stormwater treatment areas in reducing phosphorus levels through application of the Dynamic Model for Stormwater Treatment Areas (DMSTA) (Walker and Kadlec, 2001). DMSTA simulates the flows and phosphorus removal within water quality treatment facilities. The Evaluation Methodology further proposes use of the DMSTA to assess the influence of storage reservoirs on inflow volumes and TP loads to treatment facilities.

The STAs were sized using a steady-state model calibrated to soil & water-column phosphorus data from Water Conservation Area 2A. The DMSTA is an enhanced spreadsheet-based model that provides a framework for integrating experimental & field-scale monitoring data and can be used in developing designs for the next generation of treatment areas. The details of the model development and use can be found at the web site: http://wwwalker.net/dmsta/index.htm.

It is anticipated that the version of DMSTA to be applied in the evaluation will have been calibrated to available data from the Everglades Nutrient Removal Project (ENRP) and other data sets, including those developed during research and assessment of "green" technologies such as SAV (Submerged Aquatic Vegetation) and PSTA (Periphyton Stormwater Treatment Area). It will be necessary that the calibrated version of DMSTA be available for use no later than December 31, 2001 to permit its use in analyses under Contract C-E023. In order to assure that the model is properly applied, it is recommended that the authors conduct a workshop in early January 2002 at which the proper estimation of various input parameters can be discussed.

2.3. Supplemental Technologies Standard of Comparison (STSOC)

Specific peer review of the STSOCs for the supplemental treatment technologies is outside the scope of Contract C-E023. Evaluations to be conducted in connection with the basin-specific feasibility studies are required to directly incorporate the conclusions and guidance contained therein. It is noted that no STSOC has been prepared for the STA technology. It will therefore be necessary to rely upon Best Professional Judgment (BPJ) for scoring this technology relative to a number of the evaluation criteria. We recommend that proposed scoring of alternatives relying upon this technology be subjected to external review and discussion; the STA Design Review Group may be an appropriate forum for that review.

2.4. Criterium Decision Plus

A multi-criteria decision making process is proposed to facilitate the demonstration of basin-specific "optimal solutions." The software Criterium Decision Plus (CDP), produced by

Infoharvest, Inc., is proposed by the District to develop a decision model. This decision model will be used to organize, analyze and process the multi-criteria defined in Section 3.2, Evaluation Criteria. Creation of a decision model includes the following steps (CDP User's Guide):

1. Identify the goal (level 1).
2. Identify factors or criteria important in satisfying the goal (level 2).
3. Where appropriate, identify subcriteria under each criterion (level 3).
4. Identify alternatives (level 4).
5. Define weights for rating sets relative to applicable criteria/subcriteria.
6. Define scores for rating set relative to alternatives.

Steps 1 through 4 form the structure or hierarchy of the decision model with steps 5 and 6 serving as quantitative or qualitative links between levels. The hierarchy of the decision model originates at the goal, level 1, and branches off to criteria, subcriteria and at the highest level, alternatives. Each level following the goal reflects an increasing understanding of the problem, and as such, criteria at the lower levels are generally more abstract and subjective while criteria at the higher levels reflect a more quantitative understanding of the problem. The highest level is always composed of the alternatives.

Steps 1 through 3 listed above are defined by the DISTRICT, with step 2 (level 2) composed of 4 categories:

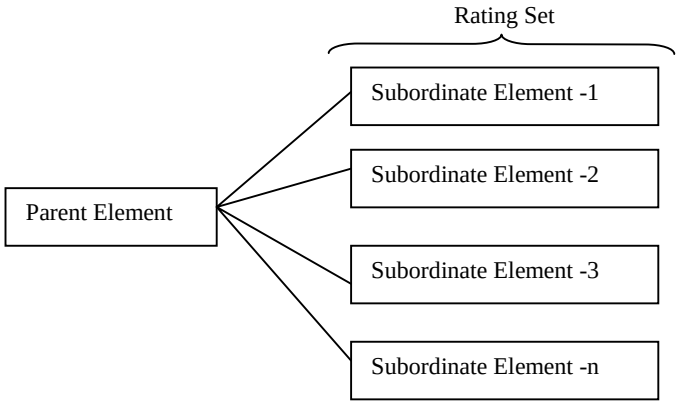
- Technical Criteria
- Environmental Criteria
- Economic Criteria
- CERP Integration Criteria

Level 3 defines the subcriteria and level 4 defines the alternatives. A tabular summary of the proposed decision model is included as Table A-1 of Appendix A.

Steps 5 and 6, listed above, provide the quantitative or qualitative link between levels of the decision model. The links are defined as weights or scores. The distinction between weight

Rating Set

and score is significant, and is determined based on the rating set's level. A rating set is a group of elements (criteria, subcriteria, or alternatives) that are subordinate to one distinct parent element (criteria or subcriteria). Each rating set can have only one parent element. A sample of a rating set is shown below.



For a rating set composed of criteria or subcriteria, weight is used to rate the subordinate elements (criteria or subcriteria) relative to the parent element. However, when a rating set is composed of alternatives (the highest level of the decision model), score is used to rate subordinate elements (alternatives) relative to the parent element. Scoring of rating sets, quantitatively and qualitatively, will be completed as part of the feasibility study while weighting will be developed separately by others (District and other stakeholders).

At the scoring level, where the rating set consists of alternatives, up to three methods of rating are available, depending on the decision model algorithm selected. A listing of algorithms and their applicable rating methods follow.

- Analytical Hierarchy Process (AHP)
  - Direct Method
  - Full Pairwise Method
  - Abbreviated Pairwise Method

- Simple Multiattribute Rating Technique (SMART)
  - Direct Method

With SMART, only the direct method can be used at the scoring level. With the direct method, single elements are rated directly with respect to the parent element, a quantitative rating is implied.

AHP allows the use of Full Pairwise and Abbreviated Pairwise methods to be applied at all levels, including the alternatives rating set. Therefore, quantitative and qualittative ratings can be applied at all levels.

With both AHP and SMART, scores are applied using one of the following rating views:

- Numerical
- Verbal
- Graphical

The rating view selected should be consistent with the scoring scale, the range of possible values attributed to an alternative relative to the parent element (criteria or subcriteria). Scales can be defined using a number of formats:

- Rank
- Numeric Range (i.e., 0 - 100)
- Percent
- Probability
- User Defined

For all formats, the scale ranges from a determined relative worst to best value. The range in values can be selected from a default menu or user defined. The range in scale is termed relative because CDP converts all scales to a standard scale, zero to one, to permit the decision model to synthesize the contributions of criteria with differing scales on an equal basis. However, the conversion from the user-defined scale to the standard scale can be defined using a value function if the SMART algorithm is selected (AHP does not permit the use of value functions). Value functions are used to explicitly define how a value on the user-defined scale is transformed to the standard scale. CDP provides three value function options:

- Linear Value Function
- Exponential Value Function
- Piecewise Linear Function

Selection of a value function should be based, to the extent possible, on the mechanism relating the parent element and alternatives.

2.4.1. Quantitative Evaluation Criteria

As described above, scoring of rating sets composed of alternatives will be completed as part of the feasibility study. The use of quantitative rating is applicable when the individual scores for the rating set (alternatives) can be related directly to the parent element based on analysis or experience. This requires a detailed understanding of the mechanism relating the parent element and alternatives. For example, if the parent element is "load reduction," the mechanism relating the load reduction of the alternatives should be understood and quantifiable based on reliable calculations, reproducible testing or documented experience.

Either AHP or SMART can be applied for quantitative analyses, with SMART providing greater flexibility with respect to converting the user-defined scale to the standard scale (AHP uses a linear conversion).

2.4.2. Qualitative Evaluation Criteria

When SMART is the chosen decision-making algorithm, one distinct constraint is established at the highest rating set (alternatives). At this rating set, only the direct rating method is applicable. At lower rating sets, where weights and not scores are applied, the Pairwise and Abbreviated Pairwise methods can be used. This is significant because the direct method of comparison is most applicable when quantitative data are available,

allowing direct numeric values to be assigned to individual subordinate elements (alternatives) relative to the parent element (criteria or subcriteria).

Without quantitative data, each subordinate element may be subjectively compared with each other using the Pairwise and Abbreviated Pairwise methods. However, this requires the use of the AHP algorithm.

Based on the subcriteria to be evaluated and fact the numerous subcriteria will be evaluated quantitatively, the use of the AHP algorithm is proposed. A summary of the proposed decision model is presented as Table A-2, Appendix A.

3. EVALUATION CRITERIA

The Evaluation Methodology proposes a total of sixteen evaluation criteria for application to the various preliminary combinations of alternative water quality improvement strategies. Those criteria are separated into four primary groupings:

- CERP Integration
- Technical Performance
- Environmental
- Economic

3.1. CERP Integration

As noted in Table 3 of the *Evaluation Methodology*, the Comprehensive Everglades Restoration Plan (CERP) includes projects within each of the fourteen basins for which feasibility studies are to be prepared. Federal and State statutes mandate that the implementation of CERP be integrated with other water resource projects (ss. 373.206, 373.1501, F.S., WRDA 2000), including the long-term water quality measures mandated by the Everglades Forever Act. Hence, the scope and timing of CERP projects need to be considered when evaluating long-term water quality solutions.

The *Evaluation Methodology* proposes three specific criteria to compare alternatives based on the characteristics of the CERP project(s) planned for that basin. For basins with no CERP project, these factors would not be included in the evaluation. For basins with a CERP project, three aspects would be evaluated, as listed below; observations resulting from our review are included in italics following each of those aspects:

Cost impact - the cost impact, i.e., savings versus additional cost, (local, state and federal) that may result by integrating the long-term water quality treatment facilities with the CERP implementation schedule;

> *It is believed that the intent here is to identify potential economies from integrating the long-term water quality treatment facilities with the CERP project – that does not necessarily extend to delaying implementation of those facilities pending completion of the CERP project. To the extent that the CERP project contributes to the effectiveness of the treatment performance, that should be reflected in the estimated cost for completion of the treatment facilities, an evaluation criterion already considered under the Economic Criteria grouping.*

Additional time to implement - the length of time, in years, after the December 31, 2006, EFA mandate that the alternative is operational; and

> *To the extent that the CERP project may form an integral component of the overall water quality improvement alternative, the schedule for completion of the CERP project influences the date of full implementation. If the CERP project has a relatively minor influence on overall treatment performance, inclusion of this criterion as stated could unduly penalize the alternative. To the extent the CERP project has a significant influence, it may be that evaluating the impact of delayed overall completion of the alternative pending CERP may be better effected by specific evaluation of the excess load discharged from the (partially complete) treatment alternative.*

Water quantity, distribution, and timing for the Everglades Protection Area, as compared to the proposed CERP project in the basin, if applicable. For integrated projects, the score will be set to 10, and for alternatives that are not integrated, the score will be based on similarity to the flows from the proposed CERP projects.

> *Section 3.1 of the* Evaluation Methodology *states "The overall goals of Everglades restoration are to improve water quality; improve the quantity,*

distribution, and timing of water; and to control the spread of exotic species…. The Comprehensive Everglades Restoration Plan is the primary mechanism for improving the quantity, distribution and timing of water, while a coordinated State and Federal program is addressing the control of exotic species." The focus of the Basin-Specific Feasibility Studies is improvement of water quality. It is not clear that the above criterion as stated is appropriate to the evaluation. To the extent that an alternative would result in additional costs to maintain the function of the CERP Project (as might be the case, for example, of an alternative that might direct water to an inappropriate point of discharge), then those costs should be included in the overall cost of the water quality improvement alternative.

Given the above, we recommend deletion of these evaluation criteria from the Evaluation Methodology. It is our opinion that the statutory mandates for integration of CERP with the water quality improvement strategies in basins tributary to the EPA can more effectively be addressed through:

- Structuring preliminary combinations of alternative water quality improvement strategies to allow direct identification of the benefits (and costs) of incorporating CERP projects as integral elements of those strategies.
- Refining the remaining evaluation criteria such that they permit direct integration of those benefits and costs in the evaluation process.

3.1.1. Structuring Alternatives for Basins with CERP Projects

Table 3 of the *Evaluation Methodology* indicates that each of the fourteen basins included in the overall scope of the Basin-Specific Feasibility Studies is scheduled to receive one or more CERP projects. In general, those CERP projects which can be projected to significantly modify discharge volumes and TP loads from any given basin should be directly considered in the structure of alternative plans of improvement. That consideration can most logically be effected through creation of a different series of pre-and-post CERP project inflow volumes and loads. The pre-CERP time series would, in the instance of the ECP Basins, consist of the STA inflow data presented in the District's *Baseline Data*.

In its simplest form, the baseline condition against which alternatives would be evaluated would consist initially of the baseline inflow data discussed in Section 2.1; that baseline data would then be adjusted at a specific point in time to reflect the impact of the CERP project on treatment system inflow volumes and loads. In other words, two sets of baseline data would be generated; alternatives would be evaluated against average annual baseline data pre-CERP up to that point in time at which CERP is fully functional, and then against average annual baseline data post-CERP. The alternative definition will need to include a specific schedule for CERP completion.

3.1.2. CERP Project Uncertainties

It is recognized that CERP includes a wide variety of separable elements scheduled for incremental completion over an extended period of time. Certain projects have been authorized; many others have not. Authorized projects can be considered to carry a higher degree of certainty in the probability of their completion, the specific nature of the project, and their scheduled completion date.

Inspection of the information presented in Table 3 of the *Evaluation Methodology* indicates that presently authorized projects have currently scheduled completion dates ranging from March 31, 2002 (S-9A Seepage Pump) to September 16, 2009 (EAA Reservoir, Part 1). Other elements of CERP which could substantively impact inflow volumes and loads have scheduled dates well after 2009 (example: the Lake Okeechobee ASR project is scheduled for completion in 2023; certain other storage facilities north of Lake Okeechobee are scheduled for completion in 2020).

In our opinion, integration of CERP projects should be considered at two levels:

- Completion of currently authorized CERP and critical restoration projects.
- Full completion of CERP.

3.1.3. Recommended Procedure

We recommend that the baseline (e.g., "no action") condition for the Basin-Specific Feasibility Studies consider completion of the CERP projects as a baseline condition. In our opinion, this will require three separate analyses in order to establish the baseline projections of the total phosphorus load discharged to the Everglades over the planning period in the event of no incremental action for additional water quality improvement strategies in the basins included in the BSFS.

The first set of analyses will be to estimate the average annual phosphorus load discharged pre-CERP, using the *Baseline Data* previously prepared by the District (for basins with an existing STA, this will extend to running the 30-year simulation with the STA inflow data of the *Baseline Data*, using the DMSTA to establish "no-action" discharges).

The second set of analyses would be prepared for modified inflow data representative of conditions that would exist following completion of currently authorized CERP and critical restoration projects. The analyses would be conducted for the full 30-year simulation, and a second set of "no-action" average annual discharges computed. This will require development of the revised inflows through use of the District's SFWMM software for that case (a close approximation could consist of a year 2010 run).

The third set of analyses would be prepared for modified inflow data representative of conditions that would exist following full CERP implementation. Once again, the analyses would be conducted for the full 30-year simulation, and a third set of "no-action" average annual discharges computed.

The first set of average annual discharges would be considered as applicable to the period between the start of the analysis period (January 2007, see subsequent discussion in this Section 3) and the completion of currently authorized CERP projects which could impact

inflow volumes and loads in any given basin (January 2010 could be used as a surrogate for that date). The third set of average annual discharges would be considered as applicable to the period following full implementation of those CERP projects which could substantially impact inflow volumes and loads in a given basin (not necessarily full completion of CERP). In the ECP basins, that might presently be selected as 2023 (completion of storage projects upstream of Lake Okeechobee).

For the period between completion of currently authorized projects and full CERP implementation, average annual discharges for the baseline condition would be computed on uniform gradient between the estimates resulting from the second and third set of analyses. The date ranges selected for the three sets of analyses would be established following the next update of the CERP Master Program Management Plan (scheduled for November 2001).

All alternative plans of improvement would then be evaluated against that composite baseline condition.

3.2. Technical Performance Criteria

A total of seven technical performance evaluation criteria are proposed in the *Evaluation Methodology*. Those criteria include:

- Level of phosphorus reduction, considering both
  - Load reduction, and
  - Concentration reduction
- Implementation schedule
- Operational flexibility
- Resiliency to fire, flood, drought and hurricane
- Potential for success in full-scale construction and operation
- Management of side streams

Those various technical evaluation criteria are discussed in the following paragraphs only if it is believed additional discussion is needed for clarification, or if refinements to the criteria are proposed.

3.2.1. Level of Phosphorus Reduction

Consideration of reduction in both load and phosphorus concentration are responsive to the specific requirements of the Everglades Forever Act, and are appropriate. As presented in the *Evaluation Methodology*, the manner in which load reduction is to be evaluated is both clear and, in our opinion, appropriate.

There does seem to be some inconsistency in the stated manner in which the level of phosphorus concentration reduction is to be evaluated. In a September 28, 2001 Technical Review Meeting at which the District presented the *Evaluation Methodology* to both Burns & McDonnell and Brown & Caldwell, it was stated that the District's intent is to apply the estimated outflow concentration as the criterion (e.g., an alternative estimated to result in a mean discharge concentration of 15 ppb would receive a score of 15 ppb). Possible options for consideration of the level of reduction in phosphorus concentration are listed below; numeric values in italicized bold text are the values which would result from the example cited in the *Evaluation Methodology*::

- Option 1: Estimated mean outflow concentration in ppb, as proposed (***15 ppb***).
- Option 2: Reduction in mean outflow concentration (ppb) from base case (***50 ppb***).
- Option 3: Variance from target outflow concentration (assumed for this discussion to be 10 ppb), with values greater than 10 ppb assigned a negative context ***(-5ppb***).
- Option 4: Degree to which the alternative approaches the target, computed as the ratio of the actual reduction in discharge concentration to the target reduction (for the example cited, (65-15)/(65-10)=50/55=***0.909***).

- Percent reduction in outflow concentration (***76.9%***). For evaluation of alternatives in which the discharge volumes do not significantly vary, this option would essentially repeat the load reduction criterion, and for that reason is not recommended.

Given those options, we concur with the District's selection of the estimated mean outflow concentration (in ppb) as the evaluation criterion, as it is not sensitive to the value selected as the target outflow concentration. We further note that this definition is consistent with that presented in the June 2000 *Evaluation Methodology for Comparison of Supplemental Technology Demonstration Projects*, prepared for the District by PEER Consultants P.C./Brown & Caldwell.

For phased implementation of alternative combinations of water quality improvement strategies, it is necessary to consider the probability of varying performance with respect to mean outflow concentration. We would recommend that this criterion be applied as the average outflow concentration following completion of all component elements of any given alternative.

3.2.2. Implementation Schedule

A single criterion is proposed in the *Evaluation Methodology*, with scoring measured in years from the date on which process design criteria is finalized (assumed to occur on January 1, 2003) to the date on which full treatment capability can be obtained.

In basins for which CERP projects are proposed, it is probable that certain alternative combinations will include consideration of the impact of the CERP projects on treatment performance. Where the scheduled completion of the CERP project is some years in the future, it would seem desirable to include an evaluation criterion which recognizes that there would be some value attached to the earliest practicable completion of remaining components of the overall alternative.

The true environmental cost associated with partial implementation of an alternative, with full implementation delayed until completion of the associated CERP project, is the projected incremental loss of Everglades habitat resulting from interim discharges exceeding the target.

One possible means to evaluate the extent of that projected incremental loss would be through application of the District's ELM software. However, it may also be practicable to use the incremental phosphorus load discharged during the interim period as a surrogate for that incremental loss. The use of incremental load as a surrogate may be more readily understood by policy makers, and less subject to technical dispute; the use of the incremental load as a surrogate is recommended. The incremental load would be computed as the average annual phosphorus load discharged above a concentration of 10 ppb, multiplied by the number of years between completion of the initial improvements and final completion of the entire alternative.

Example: Basin X is scheduled to receive a CERP project consisting of a storage reservoir upstream of an existing STA. Prior to completion of the reservoir, average annual discharges from the STA are estimated to be 650,000 acre-feet per year at a mean discharge concentration of 30 ppb. Following completion of the reservoir, average annual discharges from the STA (given no other action) are estimated to be 800,000 acre-feet per year at a mean discharge concentration of 25 ppb. The reservoir is scheduled for completion eight years after January 1, 2003. Additional water quality improvement measures include two alternatives:

- Alternative 1 consists of the construction of a CTSS facility treating discharges from the STA to a composite mean concentration of 10 ppb, given the presence of the storage reservoir. Total discharges would include 230,000 acre-feet per year discharged directly from the STA at a mean concentration of 30 ppb (higher than mean, as those discharges would occur during the higher inflow volumes and loads) and 570,000 acre-feet per year from the CTSS facility at a mean concentration of 2 ppb. The CTSS facility is

scheduled for completion four years after January 1, 2003. During the six year interim period between completion of the CTSS facility and completion of the reservoir, projected discharges from this alternative would be 420,000 acre-feet per year at a mean concentration of 2 ppb, and 230,000 acre-feet per year at a mean concentration of 35 ppb (total discharge of 650,000 acre-feet per year at a mean concentration of 14 ppb). The excess phosphorus load discharge during the six-year period would be 3,200 kg/yr (650,000 acre-feet at an excess concentration of 4 ppb). The score under this criterion for Alternative 1 would then be (3,200 kg/yr)(6 yr)=**19,200 kg**.

- Alternative 2 is similar to Alternative 1, with the exception that the CTSS is sized to result in a mean discharge concentration of 10 ppb prior to completion of the reservoir (158,000 acre-feet per year from the STA at 35 ppb, and 492,000 acre-feet per year from the CTSS at 2 ppb). The score under this criterion for Alternative 2 would then be **0 kg**. Following completion of the reservoir, the overall operation would be projected to result in a mean discharge concentration of 8 ppb (640,000 acre-feet per year from the CTSS at 2 ppb, and 160,000 acre-feet per year from the STA at 30 ppb). That lower discharge concentration would be employed in the scoring of this alternative under other evaluation criteria.

If the implementation schedule is retained as an evaluation criterion, some modifier similar to the above should be included for phased projects. However, in our opinion, the use of the "implementation schedule" criterion is not truly a technical evaluation criterion. As stated above, the true measure or value of the completion date of the alternative is the impact of the completion date on the project goal, which is improvement of the quality of water discharged to the Everglades. The long-term mass removal of total phosphorus load is throughout the *Evaluation Methodology* used as a direct measure of that improvement. To the extent the evaluation of alternatives are conducted over a common time frame, the "penalty" (negative impact) associated with delayed completion will be directly reflected in the scoring for other technical evaluation criteria (total load reduction over the planning period, cost-effectiveness, etc.).

To the extent that the definition of any given alternative includes specific definition of completion schedule for its component elements, and that incremental schedule is directly reflected in the estimation of both benefits (TP load reduction) and costs, we recommend deletion of "Implementation Schedule" as a technical evaluation criterion.

3.2.3. Operational Flexibility

It is recommended to adjust the scale to extend from negative to positive, as was also recommended at the September 17, 2001 meeting of the STADRG. As this criterion is somewhat subjective in nature, we further recommend adjusting the scoring to recognize that subjective judgment relative to the degree of relative improvement or adverse impact may not be as clear as whether or not the alternative improves or worsens operational flexibility. For that reason, we recommend that the scoring range extend from –6 to +6, distributed as follows:

- -6 to –4; the alternative reduces operational flexibility of the regional system.
- -1 to +1; the alternative has little or no impact on operational flexibility.
- +4 to +6; the alternative increases flexibility in operation of the regional system.

3.2.4. Resiliency to Fire, Flood, Drought and Hurricane

It is noted that the resiliency of any given alternative may vary with respect to the nature of the upset condition (e.g., an alternative that is generally resilient to drought may not be resilient to fire). Inasmuch as four separate "event" type upsets are considered, it is recommended that each be scored separately. The overall scoring range would extend from –4 to +4. An alternative that is generally resilient to one of the listed event types would receive a +1 score for that type; if not resilient, the alternative would receive a –1 score for that type of event. The overall score would consist of a summation of the scores for each type of event.

3.3. Environmental Evaluation Criteria

Two environmental evaluation criteria are proposed in the *Evaluation Methodology*:

- Level of reduction in non-phosphorus parameters
- Conformance to Federal Clean Water Act guidelines.

3.3.1. Level of Reduction in Non-phosphorus Parameters

It is recommended that this criterion be restated as Level of **Improvement** in Non-Phosphorus Parameters for increased clarity of intent. In anticipation that a defined and consistent suite of parameters have been considered in the various STSOCs for the various non-phosphorus parameters, it may be practicable to establish a more quantitative means of addressing this criterion by simply "counting" positive and negatives.

A total of 19 non-phosphorus parameters were to have been included in testing to be conducted for the STSOCs, as presented in Attachment B to the June 13, 2000 *Evaluation Methodology for Comparison of Supplemental Technology Demonstration Projects*. In this discussion, it is assumed that, for a given alternative, 8 of those parameters are improved, and no substantive change is projected for the remaining seven. The score for this alternative would then be 8+0=**8**. For another alternative, no substantive change is projected for seven parameters, but the levels of 8 parameters are expected to worsen. The score for this alternative would then be 0+(-8)=**-8**.

3.3.2. Conformance to Clean Water Act Guidelines

Completion of Table 4 as presented in the Evaluation Methodology would require numerous judgments to be made during the evaluation process for which no definitive guidance will be available. In our opinion, that evaluation should be more properly conducted during the conceptual design and subsequent permitting process. We recommend deletion of this criterion from the *Evaluation Methodology*.

3.4. Economic Evaluation Criteria

Four economic evaluation criteria are proposed in the *Evaluation Methodology*:

- Costs
  - Present worth of private costs
  - Present worth of public costs
  - Cost-effectiveness
- Impact on South Florida jobs

3.4.1. Costs

Application of the criterion in a consistent fashion to all alternatives in all basins will require that consistent computational parameters be employed. Those parameters include:

- Period of analysis, or project life. A project life of 50 years is proposed in the *Evaluation Methodology*.
- Estimates of escalation over the project life.
- Discount rate.

The 50-year period of analysis is consistent with the guidance presented in the Department of the Army's ER 1105-2-100 *Planning Guidance Notebook* dated April 22, 2000, and appears reasonable. No change is recommended with respect to the duration of the period of analysis. To permit consistent evaluation between basins and between alternatives with varying completion schedules, we recommend that the period of analysis be uniformly applied as extending from January 1, 2007 through January 1, 2057. All costs would be converted to present worth costs on January 1, 2007.

Estimated escalation rates and discount rates must be considered in concert. It should be noted that the economic analysis of alternatives is not necessarily the same as a funding analysis. The following suggestions for application of this evaluation criterion are consistent with guidance contained in the above-reference ER 1105-2-100 and EC 11-2-181 *Corps of Engineers Civil Works Direct Program, Program Development Guidance, Fiscal Year 2003*, dated March 31, 2001:

- All costs considered in the evaluation should be on the basis of current pricing levels (or, alternatively, pricing levels at a given, fixed point in time). In essence, escalation would not be considered in the economic analysis.
- The discount rate should be established at 6-3/8% (ref. EC 11-2-181).

Application of the above recommended guidance will permit computation of the present worth of public and private costs (two of the three cost evaluation criteria) on a consistent basis. The third criterion is cost-effectiveness, expressed as the estimated cost of the project divided by the phosphorus load removed by the project. This type of analysis, similar in nature to a conventional benefit/cost analysis, is normally conducted on an average annual basis. However, in the instance of alternatives with phased completion schedules, the average annual benefits and costs may change radically with time. For that reason, we concur with the District's proposed use of the present worth (cost) of the project over its 50 year life, divided by the total estimated phosphorus load removed by the project over that same period.

3.4.2. Impact on South Florida Jobs

The example cited in the *Evaluation Methodology* for this criterion relies upon very specific estimates of job impacts. We consider it unlikely that such specific estimates will be available for use in the conduct of the evaluation, either from the STSOCs for the various technologies or with respect to current activities on potentially available lands. It is our opinion that this evaluation more properly belongs in the subsequent conceptual

design and permitting phases, and recommend its deletion from the *Evaluation Methodology*.

4. APPROACH TO ADDRESSING KEY UNCERTAINTIES

We have reviewed the information presented in Section 3.3 of the *Evaluation Methodology* addressing key uncertainties and proposing approaches for dealing with each key uncertainty. We concur with the District's proposed approach other than as may be specifically discussed in the following paragraphs.

4.1. Uncertain Impacts of CERP

It is proposed to evaluate the impact of CERP as generally discussed in Section 3.2 of this document. We concur that, within established bounds, the DMSTA can be adapted to assess the impact of reservoirs on inflow volumes and loads to the treatment works.

5. EVALUATION PROCEDURE

The following evaluation procedure has been modified from that presented in Section 3.4 of the *Evaluation Methodology* to reflect adjustments for the recommendations contained herein.

5.1. Step 1: Establish Baseline Condition

As proposed herein, the baseline condition will be composed of three separate sets of inflow data; one for "current" conditions (for the ECP basins, all STAs complete and operational); one for conditions following completion of presently authorized CERP and critical restoration projects; and one reflecting full implementation of CERP. The following general sequence will be followed:

Step 1.1: Modify or refine the *Baseline Data* as necessary to properly reflect any necessary corrections or refinements to the results of the SFWMM simulation, and to incorporate a

base condition for performance of basin source controls. In the instance of the ECP basins, the estimated volumetric reduction, if any, in runoff volume should be directly incorporated in the results of the SFWMM simulation (would also include estimated BMP makeup water). In basins with an existing STA, compute a 30-year series of estimated outflow concentrations and loads using the DMSTA model. Convert the results to average annual data.

Step 1.2: Develop a second set of baseline data reflective of conditions which will exist following completion of all presently authorized CERP and critical restoration projects. In basins with an existing STA, rerun the DMSTA with the new inflow data for the 30-year period, convert the estimated outflow volumes and loads to average annual data. Where the CERP project consists of a proposed storage reservoir, it will be necessary to run the DMSTA using estimated inflow volumes and loads to the reservoir to develop revised inflow data for the proposed treatment facilities.

Step 1.3: Develop a third set of baseline data reflective of conditions which will exist following full implementation of CERP. Follow the same process defined above in step 1.2.

Step 1.4: Define dates on which the modified data developed in steps 1.2 and 1.3 are to be applied. Base the dates on the November 2001 scheduled update to the CERP Master Program Management Plan. For full completion of CERP, select date for full implementation as equal to the latest date on which CERP projects that may substantively influence flows and load in any given basin are scheduled for completion.

Step 1.5: Compute baseline condition as the time-integrated summation of the three inflow conditions developed in steps 1.1 through 1.3. Sum average annual discharges for the three conditions to estimated totals for the full 50-year period extending from January 2007 through January 2057. Summation would be for the inflow data in step 1.1 applied to the period January 2007 through the estimated completion date for presently authorized CERP and critical restoration projects; the average of inflows computed in steps 1.2 and 1.3 applied to the dates between the completion of currently authorized projects and full completion; and the average annual inflow volumes and loads following full completion of CERP would be applied to the dates from the estimated completion of CERP through January 2057. Those

estimated totals will form the baseline condition against which all alternative combinations of water quality improvement strategies are evaluated.

5.2. Step 2: Finalize Definition of Alternatives to be Considered

Preliminary combinations of alternative water quality improvement strategies will be proposed by the District with stakeholder involvement, and will be subjected to peer review under Contract C-E023 (ECP basins) or Contract C-E024 (ESP basins). It is anticipated that the resulting definitions will generally define the basic structure of the alternatives, and will propose specific performance targets for those alternatives. Those performance targets may, for example, vary with the relative degree of completion of CERP and critical restoration projects.

The preliminary definition of any given alternative will be refined through iterative application to the selected time series (steps 1.1, 1.2 and 1.3) until the estimated average annual performance of the alternative conforms to defined performance expectations. At the completion of this step, the average annual performance of the alternative for at least one of the three time series will have been determined.

5.3. Step 3: Evaluate Performance over the Planning Period

The estimated performance of the alternative over each of the three "baseline" periods will be evaluated. One of the three estimates of performance will have been generated in step 2. The performance of the alternative for each of the remaining two time periods will then be computed through completion of a 30-year simulation for conditions representative of each of the remaining two periods. The overall performance of the alternative relative to baseline conditions will then computed as the time-integrated performance of the alternative over the 50-year period of analysis extending from January 2007 through January 2057.

Upon completion of this step, the following evaluation criteria may be scored:

- Level of phosphorus load reduction (percentage by which the baseline phosphorus load discharged over the 50-year planning period is reduced by the alternative).

- Mean outflow phosphorus concentration (flow-weighted mean outflow concentration resulting from a 30-year simulation of the fully-implemented simulation, including all CERP-related influences).
- Scoring based on STSOC recommendations:
  - Operational flexibility
  - Resiliency to fire, flood, drought and hurricane
  - Assessment of full-scale construction and operation
  - Management of side streams
  - Level of improvement in non-phosphorus parameters

5.4. Step 4: Estimate Costs, Score Economic Evaluation Criteria

For each alternative, a conceptual-level layout of the basin-scale facility (if included in the alternative) will be prepared. Estimates of initial capital and annual operation and maintenance costs will be prepared using the unit cost criteria furnished by the District. Those estimates will include the estimated private cost associated with achieving the BMP performance levels implicit in the baseline definition. All costs will be converted to a present worth as of January 1, 2007, using a discount rate of 6-3/8% and assuming no escalation. Separate estimates of annual operation and maintenance costs will be prepared for each of the three separate periods of the analysis (e.g., current; at completion of presently authorized CERP and critical restoration projects; after full CERP implementation), applied to the schedule established for the alternative, and discounted to present worth on January 2007.

At this point, the economic evaluation criteria may be scored, including:

- Private cost (50-year present worth)
- Public cost (5-year present worth)
- Cost effectiveness (the summation of the present worth of private and public costs divided by the total TP load removed by the alternative over the 50-year planning period, computed under step 3).

5.5. Draft Report, Conduct Technical Review Meeting

All analyses and evaluations will be documented in a draft report on the Basin-Specific Feasibility Study for each basin, which will be submitted to the District for review and comment. As one element of that review process, and to facilitate review and comment by stakeholders, a Technical Review Meeting will be conducted at which the findings and conclusions of the feasibility study will be presented. In addition, as a specific element of the review, the Florida Department of Environmental Protection will be requested to provide input as to the compatibility of discharges from the various alternatives with the receiving waters. Minutes of the technical review meeting will be prepared.

5.6. Prepare and Present the Final Report

Following completion of the Technical Review Meeting, the draft report will be updated as necessary to respond to all comments received. In addition, the minutes of the technical review meeting will be included, together with all written comments received and responses thereto. The resulting final report on the Basin-Specific Feasibility Study will be submitted to the District, and the findings and conclusions of the final report will be presented to the District's Governing Board.

Appendix A

Post-Evaluation Decision-Making (Criterium Plus)

Appendix B

Minutes of September 17, 2001 Meeting of STADRG